DOWCO 290 — A NEW GROWTH REGULATOR HERBICIDE

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Summary

Initial field trials evaluating Dowco 290 (3,6-dichloropicolinic acid) are reported. Results on field brassica weed control indicate Dowco 290/diphenyl ether mixtures can be used as alternatives to the corresponding picloram mixtures with improved crop tolerance. Dowco 290/2,4-D mixtures were equally effective on Californian thistle (*Cirsium arvense*), and equal or as much as 20% less effective on ragwort (*Senecio jacobaea*) than the corresponding picloram/2,4-D mixtures. Cereals were highly tolerant to Dowco 290 though overall weed control with Dowco 290/phenoxy mixtures offered no real advantage over similar mixtures with dicamba. Dowco 290 had a short persistence in soil relative to picloram.

INTRODUCTION

Dowco 290 is a structural relative of picloram identified as 3,6-dichloropicolinic acid. Like picloram, Dowco 290 induces characteristic auxin-type responses in dicotyledonous plants. It is absorbed by both roots and leaves and is readily translocated throughout the plant. Maximum response to foliage applications has been obtained with treatments applied to actively growing plants.

Initial trials with Dowco 290 in North America identified generally excellent herbicidal activity against members of the Polygonaceae, Compositae and Leguminosae, while pasture grasses, small grains, corn and crucifers were highly tolerant (Anon. 1974). Initial residue studies indicated that unlike picloram Dowco 290 residues were quite short lived in soil (Anon. 1974). Dowco 290 was therefore assessed as a selective crop herbicide and this paper reports results of an initial trial programme.

METHODS

Broadcast applications were made to either twice or four times replicated 5 x 2 m plots with a precision sprayer. Spray volumes employed varied from 200 to 500 litres/ha. Applications to brassicas were made at from the 2 to 3 true leaf to 6 to 8 true leaf stages; to cereals at from the third true leaf stage to jointing; to Californian thistle (*Cirsium arvense*) at flower bud initiation stage and to ragwort (*Senecio jacobaea*) at the late "cabbage" stage. Weed control and crop response data are expressed as percentages based on visual estimates of two independent observers unless otherwise stated. The monoethanolamine salt of Dowco 290 was used in all trials except brassicas when the butyl ester was used.

RESULTS AND DISCUSSION

Field Brassicas: Members of the Cruciferae family show a high tolerance to Dowco 290. In one trial on turnip, swede and choumoellier, all crops tolerated up to 0.75 kg/ha, the highest rate tested, when

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applied at either 2 to 3 true leaves or at 6 to 8 true leaves. Because of tolerance to Dowco 290 of such weeds as chickweed (*Stellaria media*) and spurrey (*Spergula arvensis*) and weak activity on fathen (*Chenopodium album* agg.), mixtures with diphenyl ether herbicides were tested for broader spectrum post emergence activity. Over a series of more than twelve trials excellent tolerance to 0.2 to 0.3 kg/ha Dowco 290 plus 0.8 to 1.2 kg/ha of either nitrofen or chlornitrofen was achieved, being markedly superior to the standard 0.075 kg/ha picloram plus 1.2 kg/ha chlornitrofen. Weed control data from two trials are summarised in Table 1. Dowco 290 was slower than but finally equal to picloram on polygonaceous weeds, but more effective than picloram on composite weeds such as cotula (*Cotula dioica*) at the dosages employed.

TABLE 1: DOWCO 290 BRASSICAS — MEAN WEED RESPONSES
4 WEEKS POST-TREATMENT

Treatment	Rate kg/ha	Taranaki		Canterbury		
		% Weed Control SPEar	COTdi	% Weed Control SPEar	POLco	CHEal
Dowco 290 nitrofen	0.2 1.2	83	97	58	74	88
Dowco 290 nitrofen	0.3 1.8					
picloram nitrofen	0.075 1.2	85	47	48	68	87
picloram chlornitrofen	0.075 1.2					
nitrofen	1.8	95	0	NA	NA	NA
Untreated		0	0	0	0	0

SPEar = spurrey
COTdi = cotula

POLco = cornbind
CHEal = fathen

Broadleaf Pasture Weeds: Over five trials Dowco 290 activity against ragwort was investigated. Individual mature multicrown plants up to 20 cm high were pegged for observation of crown regrowth. A typical trial result is summarised in Table 2. In broadcast applications Dowco 290 activity when applied alone was indistinguishable from picloram, achieving 80 to 85% regrowth control almost seven months after treatment with 0.25 kg/ha of either herbicide. Mixtures of Dowco 290 with 2,4-D amine generally achieved equal or as much as 20% less control than the corresponding picloram/2,4-D mixtures.

Results of one of two trials for control of established Californian thistle are also shown in Table 2. Dowco 290 applied in combination with 2,4-D amine has been indistinguishable from the corresponding picloram treatment as assessed by regrowth of treated plant shoots, or by emergence of new shoots the following spring. A mixture of 0.25 kg Dowco 290 plus 1 kg 2,4-D/ha gave a highly significant 87% reduction of emerging shoots while the corresponding picloram/2,4-D mixture gave 84% control.

Cereals: In a series of 10 trials on wheat and barley with application times from three true leaves up to jointing no crop suppression or damage due to Dowco 290 was observed at dosages from 0.125 to 0.25 kg/ha in combination with phenoxy and hydroxybenzotrile herbicides.

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For achievement of adequate broad spectrum weed control mixtures of 0.125 to 0.25 kg/ha of Dowco 290 with either 0.375 kg/ha MCPA or 1 kg/ha MCPP or MCPA (0.375 kg/ha) bromoxynil (0.375 kg/ha) has been required. In general, substitution of 0.13 kg/ha of Dowco 290 for 0.06 to 0.13 kg/ha dicamba in a standard dicamba/MCPA cereal herbicide mixture has resulted in equivalent weed control. Dowco 290 as an additive has been slightly inferior to dicamba in control of polygonaceous weeds particularly cornbind (*Polygonum convolvulus*) but superior on composite weeds such as scentless mayweed (*Matricaria inodora*) and suppression of Californian thistle.

TABLE 2: DOWCO 290 — RAGWORT AND CALIFORNIAN THISTLE CONTROL

Treatment	kg/ha	Californian thistle		Ragwort	
		7 weeks % dieback	10 months % redn emerging shoots	12 weeks % knockdown	28 weeks % regrowth
picloram/2,4-D	0.125/0.25	—	—	97	25
	0.25/1.0	76	84	100	10
	0.5/2.0	90	84	—	—
Dowco 290/2,4-D	0.125/0.25	—	—	53	40
	0.25/1	86	87	87	30
	0.5/2	90	78	—	—
2,4-D amine	2	80	73	79	55
Dowco 290	0.25	—	—	87	15
picloram (K salt)	0.25	—	—	95	20
Untreated	—	0	92 actual shoots/m ²	0	100
LSD (5%)			35		
(1%)			53		

Brushweeds: Results of pot screening tests (Naish 1975) on gorse (*Ulex europaeus*) and broom (*Cytisus scoparius*) indicate promising activity at dosages equivalent to high volume treatments of 0.1 to 0.2 kg/100 litres. Like picloram, Dowco 290 causes a slow dieback of foliage and stems, beginning as a mild chlorosis, gradually increasing until final brown off of the plant. Brushweed activity may be influenced by formulation type; the water soluble potassium salt of Dowco 290 showing more rapid desiccant activity than the butyl ester formulated as an emulsifiable concentrate.

Soil Residues: Since Dowco 290 is an effective herbicide for rotational crops it was important to assess its persistence in soils. Soils were sampled from 11 field trials at intervals of from ten days to 19 weeks post-treatment and bioassayed by the method employed by MacDiarmid (1975). Dowco 290 was not found to persist in soil for any length of time. For example, in the Californian thistle trial reported in Table 2 no residues were found 25 days after treatments of 0.5 kg/ha Dowco 290. In only one trial were harmful residues of Dowco 290 found. This was in samples taken two weeks after treatment with 0.25 kg/ha: five weeks post-treatment no residue was found. These data are consistent with a half-life in silt loam soil of 27 days established by laboratory tests and field bioassay tests in North America which employed soybeans (Anon. 1974).

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At dosages expected to be used on cereals and brassicas in New Zealand (0.13 to 0.25 kg/ha) problems of carry-over residues affecting sensitive following crops are not anticipated. In soil Dowco 290 will exist primarily as a salt because of its low pKa and therefore could be subject to leaching (Anon. 1974). Rainfall would appear to be a major factor contributing to the disappearance of Dowco 290 from soil.

CONCLUSIONS

In an evaluation trial programme extending over eighteen months, the new growth regulator herbicide Dowco 290 has shown excellent promise as an alternative herbicide to picloram in selective herbicide mixtures for cropping agriculture. The high tolerance of the Cruciferae family and relatively short soil persistence favour its use over picloram for post emergence weed control in brassica crops. Further trials to optimise most effective combinations and dosages over a wider range of climatic and edaphic conditions should be considered. The excellent control of weeds of the Compositae family warrants further evaluation of Dowco 290 for control of these problem weeds in pasture. The effect on legume brushweeds indicated in pot tests requires further investigation.

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